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FINANCIAL MODEL BUILDING AND FINANCIAL MULTIPLIERS OF THE DANISH ECONOMY

by

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SUMMARY: The tradition of integrating real sector and financial sector models is not very established. But in the wake of the "deficit dispute" the necessity of such an integration has become more and more obvious. A consistent financial model requires a double entry accounting system for each sector involved. Data are difficult to obtain in many cases. A Danish financial model has been estimated on quarterly data (1974-1982)--with the financial wealth of the private sector and the bond rate as the most important ties to "the real world". The most uncommon feature of the model is that the bond rate is determined explicitly as a market clearing price. The abilities of the model are analyzed. Multipliers without and with real sector feedback are calculated. Not surprisingly, the feedback from investments and consumption changes the size of the multipliers considerably depending on the degree of liquidity sterilization.

Introduction

This paper undoubtedly raises more questions than it settles. Anyhow, for the purpose of communication the intermediate findings may be of some interest.

The content of the paper will be as follows. Firstly, a short historical perspective on financial sector model building within macroeconomic models is given. Secondly, some of the methodological problems involved are discussed. Thirdly, the specific Danish features of the financial sector and how I have approached them shall be dealt with in some length under the headings: The theoretical framework, Empirical findings, and financial multipliers without and with feedback from the real sector of the economy.

A historical perspective

The childhood of econometric models contemporized with that period in economic thinking where "money did not matter". Accordingly, nobody really cared about any financial relation within the econometric models for the first decade or more after the war.

For many reasons this situation could not continue unchanged. The real sector grew larger and larger measured by the number of equations and more and more financial variables showed up on the right-hand side of the equations.

This led to the first attempts at making a few financial variables endogenous. Of specific interest was the long-term rate of interest and the (financial) wealth. But as a consequence of the fierce attacks from the monetarist school one

does also see the demand for money equation more and more often.

One common feature of these very first incorporations of financial response into the real sector models was the ad hoc character of these attempts. I think not before the (late) sixties Brainard & Tobin (among others) provided the financial sector model-builder with a satisfactory theoretical framework for the construction of the financial sector within an econometric model. Since then a vast number of such models has been set up with Branson, 1968, as one of the pioneers.

Within the Nordic countries a few attempts at integrating the real and the financial sectors have been made.[1] One rather successful approach has been provided by Blomgren-Hansen, 1983, related to the Danish Economy. He took as the starting point a rather detailed balance sheet of the financial sector with all real sector variables as being exogenous. Then one by one he has endogenized almost all the most important real variables--and he is by now close to completing this model, named NATAN. One could also point to the work done by Rosted, 1980. He put two already existing models together: ADAM for the real sector and NATAN for the financial one.[2]

Methodological Reflections

According to the literature any financial (sub)model should have a firm founding in a double-entry accounting system matching debtors and creditors. The variables going into such a balance sheet model are stocks--in contrast to the flow of funds account.

One may ask in what way these stock variables can be properly measured. For instance in NATAN all variables are calcu-

lated by accumulating flows to the value of the stock at the beginning of the period. This means that any change in a stock variable mirrors the corresponding flow of cash. But through time the value of stocks may change due to changes in prices. Especially in relation to the huge bond market the actual value of the stock of bonds differs quite a lot from the accumulated flow value. This problem of valuation is also present when stocks denominated in foreign currency are considered.

The theory tells us that it is the actual (or expected) value that matters--the outstanding example is private wealth. From a practical point of view capital gains and losses do make the entire balance system more complicated--without being sure that one is able to obtain the theoretically correct measurement, anyhow.

In fact that is a general problem in the field of econometric research that one has seldom any observation of expected (or anticipated) values. Take for instance the expected return on financial (or real) assets. There are in the literature presented a number of solutions, but either they require that very tough assumptions be fulfilled or they are of an ad-hoc character.

The Structure of the Financial Sector Model (FINDAN)

A model of the Danish financial sector estimated on quarterly data (1974.1 - 1982.4) has been set up. There are six sectors:

P - Private non-banking sector (households and firms)
B - Private banks (financial institutions where liabilities

are regarded as money)

L - Local authorities (that hold accounts in private banks)

G - Central government (and other authorities that hold accounts at the central bank)

N - Central bank (Danmarks Nationalbank, Hypotekbanken, Girokontoret and a few minor institutions)

F - Foreign sector

There are five different kinds of assets/liabilities:

MB - Primary liquidity (monetary base)

DTD - Demand (DD) and time (TD) deposits added together

LO - Loans

BO - Bonds (including Treasury Bills)

VR -- Foreign exchange

In principle a 6x6 matrix could be established for each asset/liability; but in practice all sectors do not issue all 5 kinds of liabilities (or hold all 5 assets). For instance, foreign exchange can only be issued by the foreign sector and may only legally be held by private (and central) banks.

Making the entire variable-name the letter of the creditor sector is pre-set and that of the debtor sector is post-set. For instance, 'FLOP' means the accumulated amount of foreign loans to the private non-banking sector.

With five assets/liabilities and six sectors one could at the most expect 25 separate prices. Dependent on the structure of the financial markets, this number is narrowed down. For instance, all bonds, independent of the holder or issuer, are regarded as one homogeneous asset; accordingly, there is only one bond rate.

a) Concerning primary liquidity (MB) one could say that to firms and households the price is 1 (one), and the nominal rate of interest is zero. On the other hand regarding banks there is a positive price--often related to the discount rate (IDI) fixed by the central bank.[3)]

b) The rate of interest on demand and time deposits (IDD, ITD) is fixed by the banks more or less mutually. This means that one finds at these markets a kind of monopolistic price setting. Up till now the rate of interest on deposits has been rather closely linked to the discount rate.[4)]

c) Concerning bank loans the situation is very much the same. Although, when the ceiling on loans was lifted in 1980 the discrepancy between deposit rates and loan rates started to narrow somewhat. Anyhow, bank rates are not settled on conditions comparable with perfect competition --quite the opposite.
Accordingly, banks do accept deposits and grant loans at the current rates without any hesitation (except for periods where quantitative restrictions are imposed on them).

d) Quite the contrary situation is ruling at the bond market. That is a very competitive market with many small demanders and suppliers--except for the central bank. This has a dominating role due to its position of being the monetary authority and the selling agent of government bonds.[5)]

e) Foreign exchange rate and interest rate are assumed to be determined exogenously.

The Behavioural Equations of the Financial Sector Model

In this part I will only present the more general findings --the more specific details you will find in Annex 1. The period of estimation is 1974.1 - 1982.4.

The common background for all equations is taken in a conventional portfolio model, like for instance Friedman, 1978.

The private non-bank sector demands high-powered money, bank deposits and bonds (private and governmental) and issues bank loans, mortgage bonds and foreign loans. Each asset equation depends on private financial wealth, relative rates of return, income and exchange rate variations. Especially in relation to the demand for bank deposit equation I have learned a lot from Christensen, 1984. The liability equations do also depend upon the development in financial wealth, but only a very weak impact from changes in relative borrowing costs to changes in debt instruments could be detected. The statistical performance of the foreign loans equation was so poor that it was decided to make the equation the "implicit" one--derived from the other equations and the balance-sheet requirement.

According to these empirical findings one can calculate the, ceteris paribus, effect of an increase in private financial wealth of, say, 10 bill. Dkr. in 1982:

Demand for bank deposits	1.6 bill. kr.
Demand for bonds	0.6 bill. kr.
Decrease of loans in banks	1.0 bill. kr.
Decrease of bond debt	5.0 bill. kr.
(Decrease in foreign debt	1.8 bill. kr.)
Total	10.0 bill. kr.

The private sector seems more inclined to run down debt than to accumulate further assets when the financial wealth increases.[6)]

The second endogenous sector is the financial one--represented by commercial and saving banks. But due to the price-setting behaviour, explained above, of the banking sector the balance sheet of the banks is to a large extent quantitatively determined by the behaviour of households and firms with regard to assets and liabilities. Banks are willing, at least in the shorter run, to accept whatever amount of deposits and loans that is asked for (except for periods with quantitative regulations) on the ruling price (and security) conditions.

Although banks are free to change the rate of interest on deposits and loans, there has up till now been a close tie between the discount rate and the bank rates.

When banks got excess reserves they have in the estimation period on average bought bonds for app. 2/5 of the amount and increased their unborrowed reserves for the rest.

The four remaining sectors (local authorities, central government, central bank and the foreign sector) are regarded as exogenous to the private one. Accordingly, the only equations going into these sectors are identities, and institutional relations, and rules of financing deficits.

The n'th equation of the model which is suppressed due to the overall balance-sheet requirement, is decided to be the sector balance of the central bank. Accordingly, this equation will be implicit in the entire model.

Empirical Results

The variable that attracts the most interest in the Danish context is without doubt the bond rate. With the market-clearing approach to the bond market it was impossible to say in advance whether or not it would be determined reasonably well. Using a single equation approach, where the right-hand side variables are given historical values the bond rate is within the period of estimation tracked within the boundaries of ± 2 percentage points.

The results coming from a simulation of the entire model through the estimation period give the following picture, cf. figure 1.

Unfortunately, prolonging the simulation period into 1983 creates some difficulties. The pronounced fall in the nominal bond rate from 19.7 pct. in the 4th quarter of 1982 to 13.8 pct. in the 2nd quarter of 1983 is caught by the model only with a somewhat longer time lag.

Due to this state of affairs there will only be presented multipliers for the period of estimation.

Multipliers

Just to get a picture of how the financial markets interact within the model the following multiplier-simulations have been carried through:

1) Open Market Operations: Sale of 1 bill. Dkr. government bonds in 1978.1 (corresponding to app. 3 bill. Dkr. in 1984)
2) Raising the discount rate by 1 percentage point from 1978.1 onwards

3) A higher interest rate abroad (represented by the DM-rate).

Multipliers are calculated for the period 1978.1 - 1982.4. The model seems to be stable, but oscillating around a "moving equilibrium". The latter phenomenon is partly due to the fact that all stocks are measured in nominal terms and nearly doubled through the simulation period.

ad 1) 1 bill. kr. extra government bonds are assumed to be sold each quarter. This adds up to 22 bill. kr. higher supply of government bonds (BOGXU) at the end of the period. The bond rate reacts by rising app. 0.2 percentage point every quarter--leaving the level of interest somewhat 4 percentage points higher in 1982.4 compared with the control solution, cf. figure 2.

Had it only been a one-shot increase in the sale of bonds of 1 bill. kr. in 1978.1 the picture would have been a little different. Within the same quarter the interest rate goes up with .44 percentage point. In the following quarters the portfolios adjust, which reduces the rate. In a five-year perspective the lasting effect is about .22 percentage point.

This rise of the bond rate is, of course, mainly due to the response of the private non-financial sector (P-sector). It gives some information on how the model interacts to detect the way the P-sector finances the purchase of the additional bonds. Taking the first example the P-sector ends up with an increased stock of bonds of the magnitude of 32.9 bill. kr. (not 22 bill. kr. which one maybe would have expected from a more immediate view). This is due to the reaction of the banking sector (B-sector). This reduces the holdings of bonds when households and firms withdraw their deposits. This reaction of the banks puts of course an extra pressure on the bond rate.[7)]

The way the P-sector changes its portfolio is partly to run down other assets (deposits in banks and cash) and partly by borrowing--especially abroad, cf. table 1:

Table 1 How the P-sector finances the purchase of bonds

	Bill. kr.
Reduction of deposits	17.0
Reduction of cash	0.9
Borrowing abroad	12.2
"Borrowing by itself"[8)]	0.7
Borrowing in banks	2.1
Increased resources	32.9
Increased bond holdings	32.9

Table 1 also unveils that the effect on the exchange reserves is quite strong: app. 40 per cent of the purchase of bonds is financed (directly or indirectly) by borrowing abroad.

In table 2 the reactions of the B-sector are shown:

Table 2 The derived reactions of banks

	Bill. kr.
Reduction of deposits	17.0
Increased loans	2.1
Lack of resources	19.1
Sale of bonds	10.2
Reduced cash holdings	0.2
Increased borrowing in the central bank	8.7
Increase of resources	19.1

If banks had not been allowed to increase their borrowing in the central bank even more bonds would have had to change sector, which would have resulted in a further rise in the bond rate, but would also have drawn more foreign exchange to the country.

The amount of money reduces considerably due to the increased sale of government bonds. The fall in deposits of 17 bill. kr. corresponds to app. 10 percentage fall in the stock of money (1982.4)--at the "price" of 4 percentage points higher bond rate.

Linking the financial sector model (FINDAN) with the real sector

According to the results referred above an increased supply of government bonds of app. 2.5 bill. kr. in 1978.1 would raise the bond rate with 1 percentage point (with a slightly downward trend). The consequences for the "real world" of such a higher bond rate are calculated by the use of SMEC III[9)] and summarized below in table 3.

These yearly multipliers are converted into quarterly changes in a very primitive way. Anyway, the method used should at least secure consistency between the yearly and the quarterly effects, cf. annex 2.

Before making a new simulation with the financial sector model it is of crucial importance to decide upon how the increased deficit of the public sector is financed. Two alternatives have been calculated:

1) money financing (no sterilization)
2) increased supply of government bonds amounting to the sum

of the increased public sector deficit and reduced current account deficit (partial sterilization).

Table 3 "Real" effects of a 1 percentage point higher bond rate 1978-1982

change in:	1978	1979	1980	1981	1982
			mill. kr.		
GDP (Y)	- 47	- 851	-1202	-1486	-1621
Gross investm. (IF)	-130	-1150	-1320	-1298	-1111
House building (IH)	- 3	- 592	- 524	- 439	- 369
Current account (BBLBAL)[1)]	-133	- 701	- 975	-1114	-1094
Public sector (STABAL)	- 95	- 584	- 597	- 619	- 645
Private sector	+228	+1285	+1572	+1733	+1739

Note: 1) A negative sign indicates a reduced deficit of the current account of the balance of payments.

Results are summarized in table 5. Here we see that the simulation without any feedback from the real sector (no. 3) goes in between the other two simulations. If the liquidity effect derived from reduced balance of payments' deficit and increased public sector deficit is not sterilized then the rate of interest starts to fall. After 12 quarters it is back at the starting level and is still falling. This also implies that the initially positive effect on capital import is reversed, mainly due to the increased amount of liquidity within the private sector.

On the other hand sterilizing the liquidity coming from the current account and the public sector, cf. column 2 in table 5, makes the bond rate stay rather unchanged at the 1 percentage

Table 4 Simulation results of 2.5 bill. kr. extra sale of bonds

	bond rate			exchange reserves			money		
	1.	2.	3.	1.	2.	3.	1.	2.	3.
	(per cent)			(Mill. kr.)			(Mill. kr.)		
1978.1	1.11	1.11	1.11	2169	2169	2169	- 735	- 735	- 735
.2	.91	.92	.92	1639	1664	1642	-1335	-1345	-1350
.3	.98	1.02	1.02	1273	1346	1281	-1883	-1925	-1929
.4	.93	1.02	1.01	1068	1227	1085	-2302	-2421	-2422
1979.1	.78	.97	1.04	1104	1422	988	-2487	-2788	-2790
.2	.73	1.03	1.02	1148	1621	982	-2521	-3079	-3001
.3	.56	.97	.97	1304	1983	1104	-2194	-3030	-2926
.4	.44	.96	.90	1440	2366	1243	-1721	-2801	-2687
1980.1	.32	.92	.83	1577	2757	1344	-1159	-2443	-2417
.2	.22	.92	.80	1604	3033	1391	- 721	-2218	-2213
.3	.14	.95	.77	1546	3188	1372	- 470	-2253	-2142
.4	.09	1.02	.77	1391	3198	1315	- 479	-2682	-2211
1981.1	.01	1.06	.77	1474	3432	1250	- 117	-2829	-2336
.2	-.04	1.16	.78	1304	3347	1156	- 126	-3521	-2548
.3	-.11	1.14	.73	1322	3712	1246	67	-3653	-2486
.4	-.16	1.25	.75	1243	3793	1207	150	-4169	-2587
1982.1	-.22	1.18	.68	1284	4267	1319	426	-4025	-2425
.2	-.25	1.28	.69	1151	4174	1230	460	-4655	-2537
.3	-.30	1.22	.63	1152	4514	1287	633	-4748	-2463
.4	-.31	1.24	.60	1076	4658	1293	711	-5074	-2453

1. no sterilization

2. partial sterilization (the current account and the public sector)

3. no feedback from the real sector

point higher level throughout the entire period. The lower level of activity due to the higher interest rate improves, of course, the current account, but the capital account is hardly improved at all. Especially when the demand for investment goods goes down it reduces the capital import.

Effects of changes in the discount rate and the foreign rate of interest

Multipliers showing the effects of a change in the discount rate and the foreign rate of interest (represented in the model by the rate on 3 months deposits in DM) are calculated without any feedback from the real sector.

But knowing that it is only the bond rate among the financial variables that has any significant effect within SMEC III, one can use the results obtained in table 5 to find the combined effects.

When the discount rate is raised the bond rate follows with some fluctuations app. half the way up. The foreign rate of interest has a somewhat weaker influence (if the discount rate is not raised contemporaneously): The bond rate changes only by one third at the maximum, and the lasting effect is around .2.

The capital import is changing by 1.5 bill. kr. pr. 1 percentage point the discount rate change and fluctuates between 1/2 and 1 bill. kr. when the foreign rate changes by 1 percentage point.

Also the demand for money seems to be rather volatile in the wake of a change in the short-term rate of interest.

Further results are presented in table 5 below.

Table 5 Multiplier effects of a 1 percentage point higher discount rate and foreign rate of interest (DM)

	bond rate		exchange reserves		money	
	DC	DM	DC	DM	DC	DM
	-- per cent --		--- mill. kr. ---		-- mill. kr. --	
1978.1	.50	.14	1360	- 551	1021	- 932
.2	.46	.24	1744	- 875	1825	-1797
.3	.39	.32	1938	-1054	2552	-2521
.4	.37	.35	2018	-1158	3072	-3907
1979.1	.39	.35	1939	-1079	3271	-3326
.2	.37	.33	1909	- 853	3395	-3156
.3	.42	.27	1771	- 643	3201	-2800
.4	.43	.23	1646	- 505	2856	-2394
1980.1	.48	.19	1496	- 426	2487	-2079
.2	.50	.17	1426	- 415	2151	-1868
.3	.52	.16	1459	- 475	2020	-1837
.4	.52	.16	1598	- 516	2108	-1858
1981.1	.51	.15	1732	- 456	2286	-1766
.2	.48	.15	1885	- 471	2550	-1756
.3	.47	.14	1971	- 435	2719	-1682
.4	.47	.15	2112	- 508	2934	-1765
1982.1	.45	.15	2123	- 536	3024	-1838
.2	.45	.17	2191	- 669	3181	-2095
.3	.43	.18	2295	- 747	3349	-2329
.4	.45	.20	2445	- 905	3505	-2707

note: DC - discount rate

DM - foreign rate of interest (DM 3 months deposits)

Conclusions

Unfortunately, no firm conclusion can be derived as far as the model needs to be fully integrated with the real economy before this can be done safely. Anyhow, the results seem to depend quite a lot on the sterilization policy of the monetary authorities. If no sterilization takes place the effect of an increased rate of interest is reversed during a five years period. Even though the inflow of liquidity is sterilized leaving the interest at the higher level capital imports nearly dry up due to lower activity and thus demand for credit.

According to the real sector model (SMEC III) it is mainly the bond rate that influences the demand for investment goods and consumption (via the public sector debt). Therefore, a twist in the structure of the interest rate in the direction of relatively lower long-term rates seems to have some advantages regarding activity as well as capital import.

But also in this case it can hardly be stressed too strongly that no empirical results are any better than the underlying model.

NOTES

1. Bank of Finland has a fully integrated financial and real model based on quarterly data, cf. Tarkka, 1984.

2. One of the main problems carrying out this study was the different time-periods which had been used; ADAM is an annual model whereas NATAN has a half year as the time unit.

3. The so-called 'money market' where private banks deal with cash does sometimes settle a price different from the discount rate (plus 4 per cent), typically when money is in short supply during an exchange crisis; this aspect has not yet been integrated into the model.

4. For 'special deposits'--big deposits for a fixed time period--the interest rate is negotiated more freely, but more often than not the outcome is rather closely related to the terms ruling at the money market.

5. By way of organizing the daily dealing at the bond market government bonds open the market. This forces the central bank to play with open cards, so to speak, from the beginning of the day.

6. This adjustment pattern might be somewhat overstated due to the lack of proper consideration of tax rules. Within the Danish tax system gains can be obtained by stretching the balance sheet.

7. All stocks are calculated at flow values. If one had taken into consideration the drastic fall in bond prices due to the increased rate of interest one would hardly have seen any rise in the amount of bonds held by the P-sector.

8. Due to portfolio expansion which more than offsets the effect from change in relative rates. Had the feedback from the real sector been taken into account the lower level of investment would have reduced the private supply of bonds.

9. SMEC III is documented in J. Fabritius, 1979. A number of modifications have taken place since, cf. Knudsen, 1984.

LIST OF LITERATURE

The literature on this topic is vast, below are stated only titles directly referred to in the paper; in addition a few numbers concerning the specific Danish institutions are listed.

BLOMGREN-HANSEN, N.: An Econometric Study of the Financial Sector in Denmark (unpublished), Philadelphia, 1975.

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FIGURE 1 THE ACTUAL AND FITTED VALUE OF THE INTEREST RATE OF BONDS.

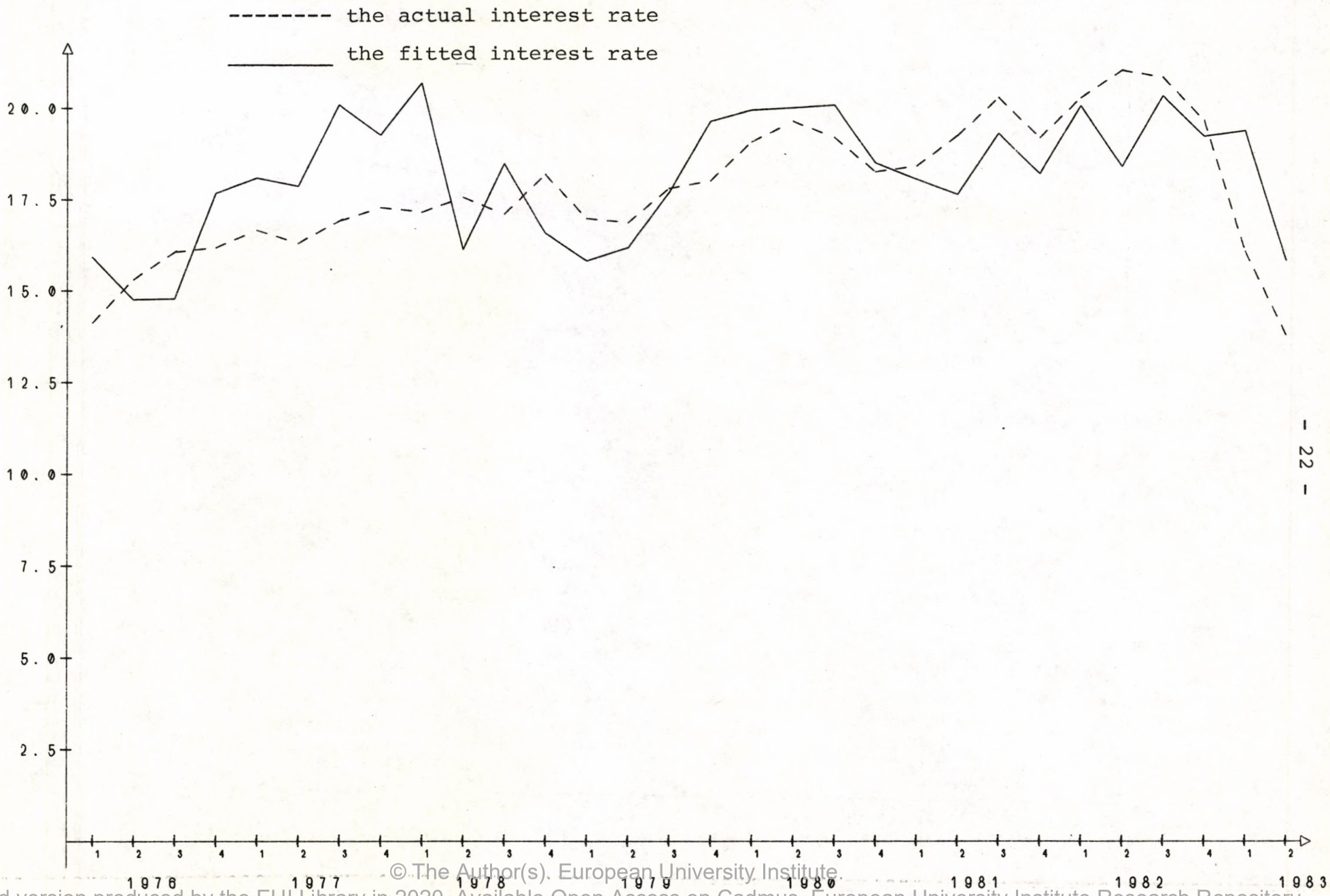
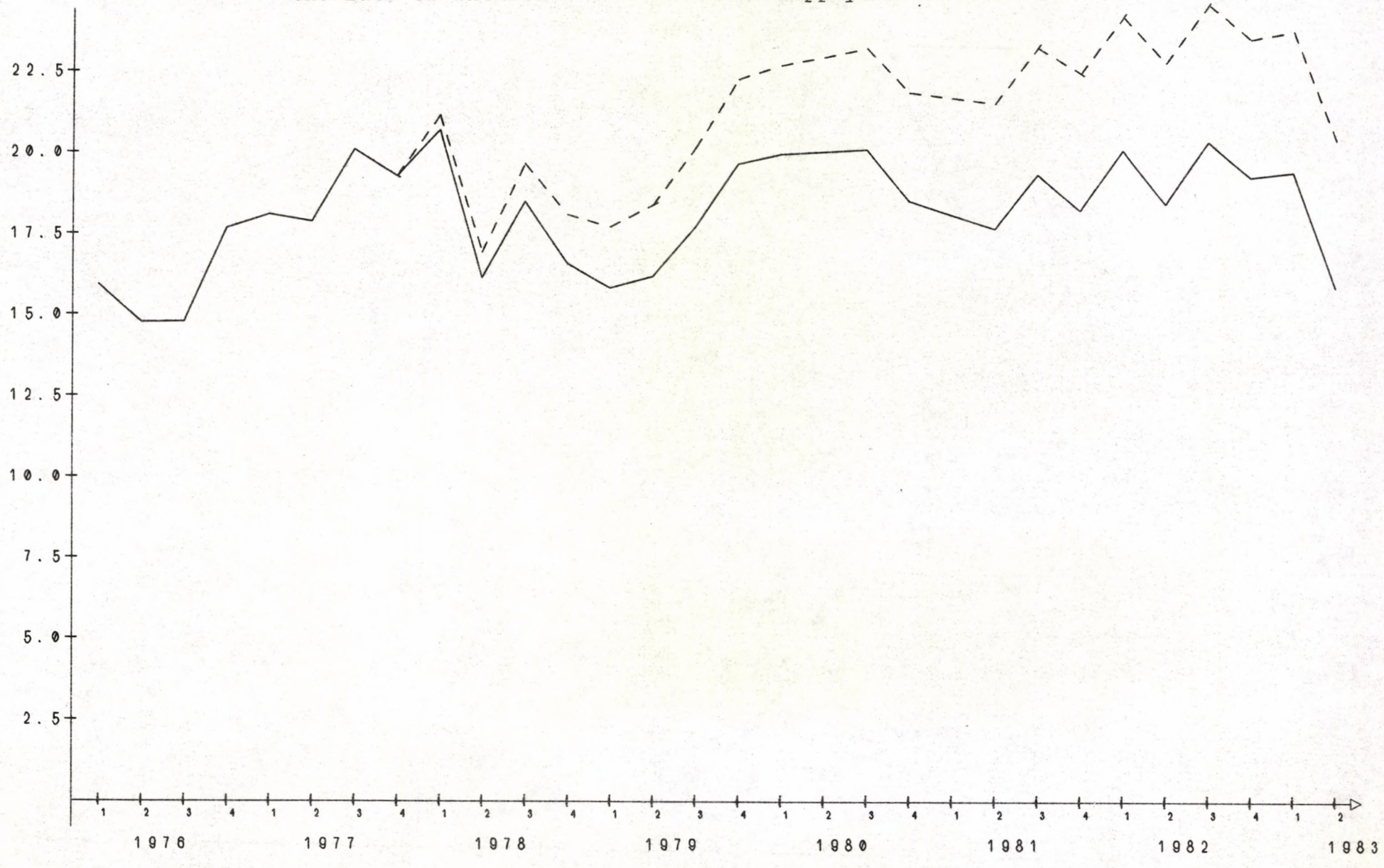


FIGURE 2: THE EFFECT OF INCREASING THE SUPPLY OF BONDS BY 1 BILL. Dkr. EACH QUARTER FROM 1978.1

_____ the rate of interest with unchanged input-values

--------- the rate of interest with increased supply of bonds



List of (Main) Variables

All endogenous variables are explained in the listing of the model. Accordingly, only the more important exogenous variables will be mentioned below.

DUMIN	Dummy taking into account the introduction of treasury bills in 1976
DUM1,2,3,4	Seasonal dummies
EDM	German/Danish exchange rate
IDM3	DM rate of interest
IDI	Danish discount rate
Y	GDP
IH	Investments in housing
IF	Gross investments
BBLBAL	Current account on the balance of payments (+ = deficit)
STABAL	Central government balance (- = deficit)
KOMBAL	Local government balance
NATBAL	Central Bank Balance
IDD	Demand deposit interest rate
ITD	Time deposit interest rate
ILO	Load interest rate
SBALBO	The amount of the government deficit financed by bonds
BOGXU	The supply of government bonds (incl. treasury bills)
PWEX	Total financial assets held by private sector
IBO	Bond interest rate
PWEPX	Private sector financial net wealth
PDTDB	Private sector bank deposits

PBOXU	Private sector's bonds
BLOP	Private sector bank loans
FLOPX	Private sector foreign loans
BOPX	Private sector bond issues
NLOB	Private banks' loan in central bank
LDDT	Local governments' deposits
MBN	Supply of primary liquidity from central bank
GLON	Central government's loans to the central bank
NVRFX	Official exchange reserves held by the central bank
BOGXU	Supply of government bonds and bills
BOXU	Aggregate supply of bonds from all sectors
FWEFW	Total foreign debt
GWEGX	Central government debt

All stocks are accounted in values of actuated flows and in mill. Dkr.

Interest rates are presented as percentage points.

Exchange rate DKR/DM.

Dummies have the value of 1 when they are activated.

ANNEX 1

FINDAN - a Financial-sector Model for the Danish Economy (estimated on quarterly data from 1973. to 1982.4)

1. Private non-financial sector (P-sector)

a. ASSETS

Demand for Primary Liquidity (PMBN)

```
E100 KPMBN  =-.0661+.38*Y/PWEX(-1)-.00181*(ITD-IDI)+
              .0031*DUM4$
E110 PMBN   =KPMBN*PWEX(-1)$
```

Demand for Bank Deposits (PDTDB)

```
PDTDB  =EXP(.3694)*((.4*Y+.3*Y(-1)+.2*Y(-2)+.1*Y(-3))**1.273)*
        ((100*EDM(-1)/EDM(-5))**(-.6516))*
        ((.4*IDM3+.3*IDM3(-1)+.2*IDM3(-2)+.1*IDM3(-3))**(-.081))
         *
        ((.4*IBO+.3*IBO(-1)+.2*IBO(-2)+.1*IBO(-3))**(-.34)) *
        ((PWEPX+100000)**.0385)$
```

Demand for Bonds and Treasury Bills (PBOXU)

```
E130 KPBOXU =.361-.0049*(IBO-IBO(-1))+.0074*IBO+.0092*DUM2
             +.0272*DUMIN-.023*(EDM(-1)/EDM(-5)-1)+
             +.0627*PWEPX/PWEX(-1)$
E140 PBOXU  =KPBOXU*PWEX(-1)$
```

Total Assets

```
E150 PWEX   =PMBN+PDTDB+PBOXU+BWEBX+PLOL$
```

b. LIABILITIES

Bank Loans (BLOP)

```
E160 KBLOP  =.116+.6157*IH/Y+.6304*Y/PWEX(-1)
             -.1014*PWEPX(-1)/PWEX(-2)$
E170 BLOP   =KBLOP*PWEX(-1)$
```

Foreign Loans (FLOP)

```
E200 FLOPX  =WEPX-BLOP-BOPX-GLOP-HLOP-ELOP$
```

Bond Issues (BOPX)

```
E210  KBOPX=.56+1.2874*IF/PWEX(-1)-.0037*(IBO-.5*ILO)-
            .4804*PWEPX/PWEX(-1)$
E230  BOPX  =KBOPX*PWEX(-1)$
```

Financial net Wealth (PWEPX)

```
E250  PWEPX =-BBLBAL-STABAL-NATBAL-KOMBAL+PWEPX(-1)$
```

Total Liabilities (WEPX)

```
E260  WEPX  =PWEX-PWEPX$
```

2. Private Banks (B-sector)

a. RATES OF INTEREST

Demand Deposits (IDD)

```
E270  IDD   =.54864-3+.35500*IDI+.64503*IDD(-1)$
```

Time Deposits (ITD)

```
E280  ITD   =12.1-4.5+.8256*IDI-13.227*(PDTDB(-1)
                                    +LTDB(-1))/BWEX(-2)$
```

Bank Loans (ILO)

```
E290  ILO   =1.0226+.96765*IDI+.1467*ILO(-1)+.16363*IBO$
```

b. ASSETS

Demand for Primary Liquidity (BMBN)

```
E330  KBMBN =.00666*(LTDB+PDTDB+LDDB)/BWEX+524.0822*(1/BWEX)
           -.004*DUM1-.002*DUM2-.0041*DUM3+.4091*KBMBN(-1)$
E340  BMBN  =KBMBN*BWEX$
```

Bond Holdings (BBOXU)

```
E350  DKBOXU=2.4-5.199*(ILO-ILO(-1))+
            392.859*(LIK/BWEX(-1)-LIK(-1)/BWEX(-2))$
E360  KBBOXU=DKBOXU/1000+KBBOXU(-1)$
E370  BBOXU =KBBOXU*BWEX(-1)$
E380  LIK   =PDTDB+LDDB+LTDB+FDEB-BLOP-BLOL-BLOF$
```

Total Assets (BWEX)

```
E390  BWEX  =BMBN+BVRFX+BDEN+BLOP+BLOL+BLOF+BBOXU+BBOF$
```

c. LIABILITIES

Loans in the central Bank (NLOB)

```
E300  NLOB  =BMBN+BVRFX+BDEN+BLOP+BLOL+BLOF+BBOXU+BBOF-PDTDB-
            LDDB-LTDB-FDEB-FLOB-BWEBX$
```

Total Liabilities (except net wealth) (WEBX)

```
E310  WEBX  =PDTDB+LDDB+LTDB+FDEB+NLOB+FLOB
```

Financial net Wealth (BWEBX)

```
E320  BWEBX =BWEBX(-1)+PIBAL$
```

3. The Bond Market

Interest Rate (IBO)

```
E440  IBO =1/(PWEX(-1)*.0062)*(BOLX+BOGXU-LBOX-NBOX-GBOXU
      -FBOX-BBOXU+PWEX(-1)*(.56+1.2874*IF/PWEX(-1)+.0037*.5
      *ILO-.48*PWEPX/PWEX(-1))
      -PWEX(-1)*(.361+.0049*IBO(-1)+.0092*DUM2+.0272*DUMIN-.023*
      (EDM(-1)/EDM(-5)-1)+.0627*PWEPX/PWEX(-1)))$
```

ANNEX 2

Input data for the 'real' variables and supply of additional bonds (SBALBO)

period	Y	IH	IF	BBLBAL	STABAL	SBALBO 1.	SBALBO 2.
	mill. kr.						
1978.1	0	0	0	0	0	2500	2500
.2	-5	0	-20	-20	-10	0	30
.3	-15	0	-40	-40	-25	0	65
.4	-28	-3	-70	-70	-60	0	130
1979.1	-172	-150	-225	-125	-135	0	260
.2	-192	-150	-243	-150	-145	0	295
.3	-233	-150	-332	-200	-150	0	350
.4	-253	-142	-350	-225	-150	0	375
1980.1	-260	-131	-330	-230	-150	0	380
.2	-280	-131	-330	-240	-150	0	390
.3	-321	-131	-330	-250	-150	0	400
.4	-341	-131	-330	-255	-150	0	405
1981.1	-361	-110	-325	-265	-154	0	419
.2	-371	-110	-325	-275	-154	0	429
.3	-371	-110	-325	-285	-154	0	439
.4	-381	-110	-325	-295	-154	0	449
1982.1	-395	- 93	-310	-288	-161	0	449
.2	-400	- 92	-290	-278	-161	0	439
.3	-410	- 92	-270	-268	-161	0	429
.4	-415	- 92	-241	-258	-161	0	419

Y - GDP

IF - Total investments

IH - Investments in new houses

BBLBAL - Balance of Payments Current Account (- = reduced deficit)

STABAL - Public sector balance (- = increased deficit)

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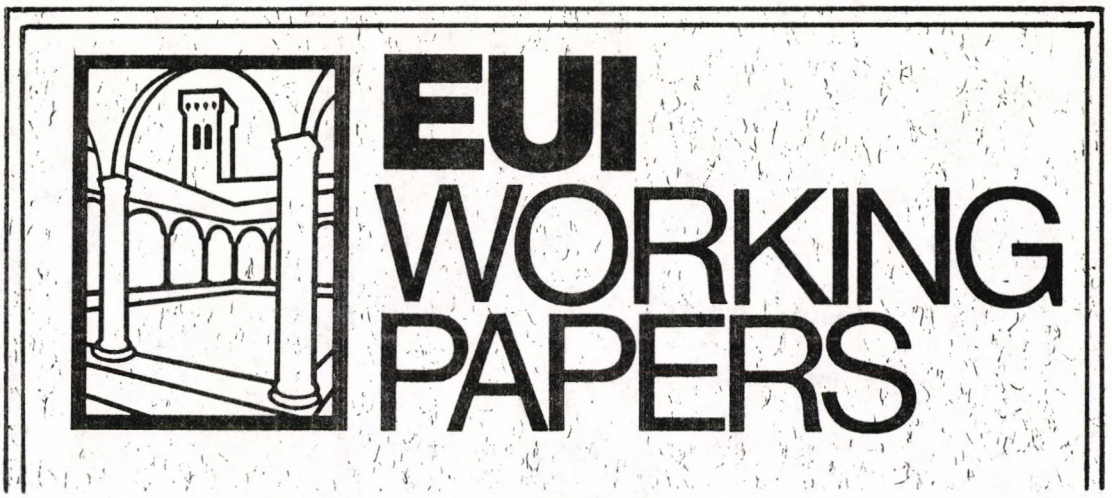

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